DIETHANOLAMINE

Diethanolamine is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 111-42-2 $(HOC_2H_4)_2NH$

Molecular Formula: $C_4H_{11}NO_2$

Diethanolamine exists as crystals or as a liquid and has a mild ammonia odor (Merck, 1983). It is very soluble in alcohol; miscible with water, methanol, and acetone; and insoluble in ether and benzene. Diethanolamine is also combustible (Sax, 1987).

Physical Properties of Diethanolamine

Synonyms: 2,2'-iminobisethanol; 2,2'-iminodiethanol; diethylolamine; 2,2'-dihydroxydiethylamine; bis(2-hydroxyethyl) amine

Molecular Weight:	105.14
Boiling Point:	268.8 °C
Melting Point:	28 °C
Flash Point:	152 °C (306 °F) open cup
Vapor Density:	3.65 (air = 1)
Density/Specific Gravity:	1.09664 at 20/4 °C (water = 1)
Vapor Pressure:	2.8×10^{-4} mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	-1.43
Henry's Law Constant:	5.35×10^{-14} atm-m^3/mole at 25 °C
Conversion Factor:	1 ppm = 4.3 mg/m^3

(Howard, 1990; HSDB, 1991; Merck, 1983; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Diethanolamine is used in the production of lubricants for the textile industry, as a humectant and softening agent, in organic synthesis, as an absorbent for acid gases, as a gas conditioning agent, as a solubilizer for pesticides, as a dispersing agent in the application of agricultural chemicals, and as a chemical intermediate for rubber chemicals and many other products.

Diethanolamine is also used in consumer products such as emulsion paints, cutting oil, shampoos,

cleaners and polishes, and textile specialties (HSDB, 1991).

The primary stationary sources that have reported emissions of diethanolamine in California are newspaper printing and publishing, and funeral and crematorium services (ARB, 1997b).

B. Emissions

The total emissions of diethanolamine from stationary sources in California are estimated to be at least 1,900 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of diethanolamine was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of diethanolamine.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of diethanolamine was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Diethanolamine is expected to exist almost entirely in the vapor phase in the atmosphere based on its vapor pressure. The dominant tropospheric loss process for diethanolamine is expected to be with the hydroxyl (OH) radical. The calculated half-life and lifetime of diethanolamine due to reaction with the OH radical are about 3 hours and 4 hours, respectively (Atkinson, 1995). The solubility of diethanolamine in water indicates that this compound may also be removed from the atmosphere through precipitation. Diethanolamine may also undergo nitrosation reactions (Howard, 1990).

AB 2588 RISK ASSESSMENT INFORMATION

Although diethanolamine is reported as being emitted in California from stationary sources no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to diethanolamine are inhalation and dermal contact.

Non-Cancer: Acute inhalation overexposure to diethanolamine in humans may result in irritation of the nose and throat. Effects on the liver, kidney, bone marrow, brain, spinal cord, and skin have been reported in animal studies of chronic oral and dermal exposures (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) nor an oral Reference Dose (RfD) for diethanolamine (U.S. EPA, 1994a).

No information is available on adverse reproductive or developmental effects of diethanolamine in humans. Oral exposure to diethanolamine in test animals has been reported to cause testicular degeneration and reduced sperm motility (U.S. EPA, 1994a).

Cancer: No information is available on the carcinogenic effects of diethanolamine in humans or animals; however, a 2-year cancer bioassay by the National Toxicology Program is currently in progress. The International Agency for Research on Cancer and the U.S. EPA have not classified diethanolamine as to its carcinogenicity in humans (IARC, 1987a; U.S. EPA, 1994a).